FACTS ON FILE

EMSP

Environmental Management Science Program

Project Highlights

The Environmental Management Science Program (EMSP) is funding basic research projects focused on solving the most difficult problems that threaten the closure plans of DOE sites. This fact sheet highlights just one.

Chaotic-Dynamical Conceptual Model to Describe Fluid Flow and Contaminant Transport in a Fractured Vadose Zone

The purpose of this project is to determine if and when dynamic chaos theory can be used to investigate infiltration of fluid and contaminant transport in heterogeneous soils and fractured rocks. The approach assumes that non-linear dynamics, and in particular, chaotic processes affect spatial heterogeneity and flow phenomena. This project combines the use of field and laboratory experiments to develop numerical models of the chaotic behavior. The results are expected to change the conventional approach of using traditional stochastic and/or deterministic methods to predict flow and transport in an environmental system. A direct benefit will be improved vadose zone site characterization and predictability at DOE sites.

Locations: Lawrence Berkeley National Laboratory

Year of Award: 1996

Amount of Award: $1,440,000

Office of Environmental Management (EM) Problem Area: Remedial Action

Office of Science (SC) Scientific Category/Sub-Category: Hydrogeology/Instrumentation and Modeling

Research Value/Impact: In mixed soil or fractured rock environments between the earth's surface and the water table, water flow processes are non-linear and chaotic. However, hydrogeologists at Lawrence Berkeley National Laboratory have uncovered equations that describe the pattern of fractures in basalt and the trajectory of flow paths in the basalt. When researchers find the best equations to describe water flow at the appropriate scales, their hierarchical model may help guide waste remediation efforts and environmental monitoring. With the best models in hand, environmental restoration stands the best chance of stopping contamination before it seeps into the water table.

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More Information on the Web:
http://www.em.doe.gov/science or
http://www.id.doe.gov/emsystems/emsp